Big Bang

1 Scientists who proposed the Big Bang Theory were attempting to explain
(1) the origin of the universe
(2) why stars have different luminosities
(3) the formation of our solar system
(4) how Earth's atmosphere evolved

2 The red shift in light from stars located in very distant galaxies suggests that these stars are
(1) decreasing in temperature
(2) increasing in temperature
(3) moving toward the Milky Way
(4) moving away from the Milky Way

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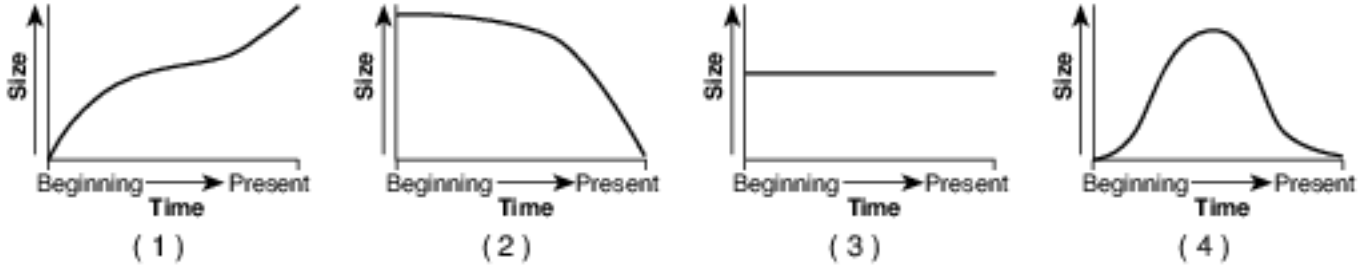
3 According to the Big Bang theory, which graph best represents the relationship between time and the size of the universe from the beginning of the universe to the present?



(1) 1
(2) 2
(3) 3
(4) 4

4 Which information best supports the inference that the universe began with an explosion?
(1) measurements of rates of decay using carbon-14
(2) measurements of cosmic background radiation
(3) calculations of the distance from the Sun to each asteroid in the asteroid belt
(4) calculations of the temperature and luminosity of stars

5 A blue shift of the light from a star indicates that the star
(1) will soon become a main sequence star
(2) will soon become a giant star
(3) is moving closer to Earth
(4) is moving away from Earth

6 A red shift in the light from very distant galaxies suggests that the universe is
(1) fixed and stationary
(2) moving randomly
(3) contracting
(4) expanding

7 The theory that the universe is expanding is supported by data from the
(1) nuclear decay of radioactive materials
(2) nuclear fusion of radioactive materials
(3) blue shift of light from distant galaxies
(4) red shift of light from distant galaxies

8 Fourteen billion years represents the approximate age of
(1) Earth
(2) Earth's Moon
(3) our solar system
(4) the universe

9 According to astronomers, the age of the universe is estimated to be

(1) 1.3 billion years
(2) 4.6 billion years
(3) 7.9 billion years
(4) 13.8 billion years

10 Light from distant galaxies most likely shows a

(1) red shift, indicating that the universe is expanding
(2) red shift, indicating that the universe is contracting
(3) blue shift, indicating that the universe is expanding
(4) blue shift, indicating that the universe is contracting

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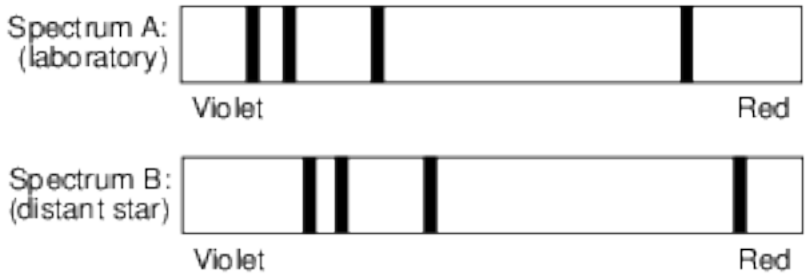
11 The diagram below represents the light spectra given off by the same element as observed under two different conditions. Spectrum A was observed when that element was heated in a laboratory. Spectrum B shows the same element as seen in the light from a distant star.



The light spectrum observed from this distant star shows a

(1) red shift, which indicates that the star is moving away from Earth
(2) red shift, which indicates that the star is moving toward Earth
(3) blue shift, which indicates that the star is moving away from Earth
(4) blue shift, which indicates that the star is moving toward Earth

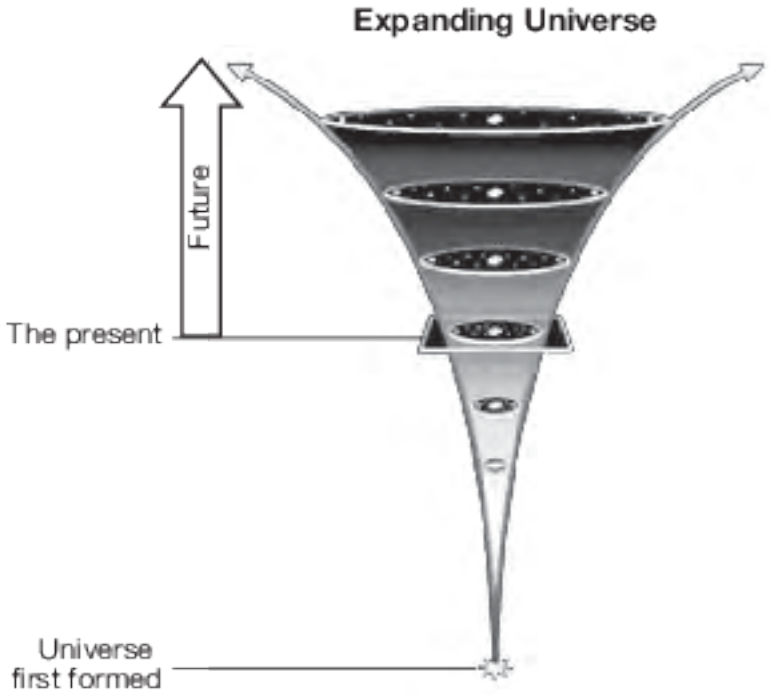
12 Cosmic background radiation detected from all directions in space provides evidence for the

(1) greenhouse effect
(2) Doppler effect
(3) geocentric theory
(4) Big Bang theory

13 What are two pieces of evidence that support the Big Bang Theory?

(1) red shift of light and cosmic background radiation
(2) red shift of light and the different shapes of galaxies
(3) planetary motion and cosmic background radiation
(4) planetary motion and the different shapes of galaxies

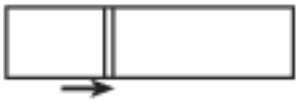
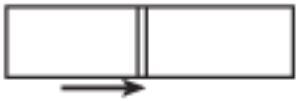
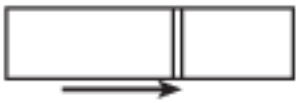
Base your answers to questions 14 on the diagram below and on your knowledge of Earth science. The diagram represents a model of the expanding universe.



14 Identify the name of the event that is inferred by scientists to have occurred when the universe first formed. [1]

Base your answers to questions 15 on the data table below and on your knowledge of Earth science. The data table lists four constellations in which star clusters are seen from Earth. A star cluster is a group of stars near each other in space. Stars in the same cluster move at the same velocity. The length of the arrows in the table represents the amount of redshift of two wavelengths of visible light emitted by these star clusters.

Data Table

Constellation in which star cluster is seen from Earth	Redshift of two wavelengths of light absorbed by calcium	Distance from Earth (billion light years)	Velocity of star cluster moving away from Earth (km/s)
Ursa Major	Violet  Red	1.0	15,000
Corona Borealis	Violet  Red	1.4	22,000
Boötes	Violet  Red	2.5	39,000
Hydra	Violet  Red	4.0	61,000

Note: One light year is the distance light travels in one year.

15 Describe the evidence shown by the light from these star clusters that indicates that these clusters are moving away from Earth. [1]

Answer Keys

1 1

2 4

3 1

4 2

5 3

6 4

7 4

8 4

9 4

10 1

11 1

12 4

13 1

14 Allow 1 credit for Big Bang or Big Bang Theory.

15 Allow 1 credit. Acceptable responses include, but are not limited to:

- — The wavelengths are shifting toward the red end of the spectrum.
- — The farther a star cluster is from Earth, the more the redshift.
- — redshift of light
- — The wavelengths of light are getting longer or increasing.
- Note: Do not allow credit for “the more red in color a star is, the more it is moving away” because
- star color alone does not indicate motion.